

**What is claimed:**

1. A composition for inhibiting HIV-1 infection comprising at least two compounds in synergistically effective amounts for inhibiting HIV-1 infection, wherein at least one of the compounds prevents the productive interaction between HIV-1 and an HIV-1 fusion co-receptor.
2. A composition which inhibits fusion of HIV-1 or an HIV-1 envelope glycoprotein<sup>+</sup> cell to a target cell, comprising at least two compounds in synergistically effective amounts for inhibiting fusion of HIV-1 or an HIV-1 envelope glycoprotein<sup>+</sup> cell to a target cell, wherein at least one of the compounds prevents the productive interaction between HIV-1 and an HIV-1 fusion co-receptor.
3. The composition of claims 1 or 2 wherein the co-receptor is a chemokine receptor.
4. The composition of claim 3, wherein the chemokine receptor is CCR5 or CXCR4.
5. The composition of claim 1 or 2 wherein at least one of the compounds is an antibody.
6. The composition of claim 5, wherein the antibody is a monoclonal antibody.
7. The composition of claim 5, wherein the antibody is an anti-chemokine receptor antibody.
8. The composition of claim 7, wherein the antibody is an anti-CCR5 antibody.
9. The composition of claims 1 or 2, wherein two or more compounds are antibodies.

10. The composition of claims 8, wherein the antibody is PA8, PA9, PA10, PA11, PA12, PA14, 2D7 or a combination thereof.
- 5
11. The composition of claim 10, wherein the antibodies are in an appropriate ratio.
12. The composition of claim 11, wherein the ratio ranges from 1:1 to 50:1.
- 10
13. The composition of claim 9, wherein the antibody is PA8, PA9, PA10, PA11, PA12, PA14, 2D7 or a combination thereof.
- 15
14. The composition of claim 13, wherein the antibodies are in an appropriate ratio.
15. The composition of claim 14, wherein the ratio ranges from 1:1 to 50:1.
- 20
16. The composition of claims 1 or 2 wherein at least one compound is a chemokine or a chemokine derivative.
- 25
17. The composition of claim 16, wherein the chemokine is RANTES, MIP-1 $\alpha$ , MIP-1 $\beta$ , SDF-1 or a combination thereof.
- 30
18. The composition of claim 16, wherein the chemokine derivative is Met-RANTES, AOP-RANTES or RANTES 9-68 or a combination thereof.
- 35
19. The composition of claim 16, wherein the compounds are in an appropriate ratio.
20. The composition of claim 5, wherein at least one

compound is a chemokine or chemokine derivative.

5 21. The composition of claim 20, wherein the chemokine is RANTES, MIP-1 $\alpha$ , MIP-1 $\beta$ , SDF-1 or a combination thereof.

10 22. The composition of claim 20, wherein the chemokine derivative is Met-RANTES, AOP-RANTES or RANTES 9-68 or a combination thereof.

23. The composition of claim 20, wherein the compounds are in an appropriate ratio.

15 24. The composition of claims 1 or 2, wherein at least one of the compounds is a nonpeptidyl molecule.

25. The composition of claim 24, wherein the nonpeptidyl molecule is the bicyclam AMD3100.

20 26. The composition of claims 1 or 2 wherein at least one of the compounds inhibits the attachment of HIV-1 to a target cell.

25 27. The composition of claim 26, wherein at least one of the compounds binds CD4.

28. The composition of claim 27, wherein at least one of the compounds is an HIV-1 envelope glycoprotein.

30 29. The composition of claim 27, wherein at least one of the compounds is an anti-CD4 antibody.

35 30. The composition of claim 26, wherein at least one of the compounds binds to the HIV-1 envelope glycoprotein.

31. The composition of claim 26, wherein at least one of

the compounds is a CD4-based protein.

32. The composition of claim 31, wherein at least one of the compounds is CD4-IgG2.

5

33. The composition if claim 26, wherein at least one of the compounds is an antibody to an HIV-1 envelope glycoprotein.

10

34. The composition of claim 26, wherein the compounds are in an appropriate ratio.

35. The composition of claim 34, wherein the ratio ranges from 1:1 to 10:1.

15

36. The composition of claim 5 wherein at least one of the compounds inhibits the attachment of HIV-1 to a target cell.

20

37. The composition of claim 36, wherein at least one of the compounds binds CD4.

38. The composition of claim 37, wherein at least one of the compounds is an HIV-1 envelope glycoprotein.

25

39. The composition of claim of claim 37, wherein at least one of the compounds is an anti-CD4 antibody.

30

40. The composition of claim 36, wherein at least one of the compounds binds to the HIV-1 envelope glycoprotein.

41. The composition of claim 36, wherein at least one of the compounds is a CD4-based protein.

35

42. The composition of claim 41, wherein at least one of the compounds is CD4-IgG2.

43. The composition of claim 36, wherein at least one of the compounds is an antibody to an HIV-1 envelope glycoprotein.
- 5
44. The composition of claim 36, wherein the compounds are in an appropriate ratio.
45. The composition of claim 44, wherein the ratio ranges from 1:1 to 10:1.
- 10
46. The composition of claims 1 or 2, wherein at least one of the compounds comprises a polypeptide which binds to a CCR5 epitope.
- 15
47. The composition of claim 46, wherein the epitope is located in the N-terminus.
48. The composition of claim 46, wherein the compound is a polypeptide.
- 20
49. The composition of claim 47, wherein the epitope comprises N13 and Y15 in the N-terminus.
- 25
50. The composition of claim 46, wherein the epitope includes residues in the N-terminus and second extracellular loop.
- 30
51. The composition of claim 50, wherein the epitope comprises D2, Y3, Q4, S7, P8 and N13 in the N-terminus and Y176 and T177 in the second extracellular loop.
- 35
52. The composition of claim 50, wherein the epitope comprises D2, Y3, Q4, P8 and N13 in the N-terminus and Y176 and T177 in the second extracellular loop.

53. The composition of claim 47, wherein the epitope comprises Q4 in the N-terminus.
54. The composition of claim 50, wherein the epitope comprises D2 in the N-terminus and R168 and Y176 in the second extracellular loop.
55. The composition of claim 46, wherein the epitope is located in the second extra cellular loop.
56. The composition of claim 55, wherein the epitope comprises Q170 and K171 in the second extracellular loop.
57. The composition of claim 55, wherein the epitope comprises Q170 and E172 in the second extra cellular loop.
58. The composition of claims 1 or 2 wherein at least one of the compounds comprises a light chain of an antibody.
59. The composition of claims 1 or 2 wherein at least one of the compounds comprises a heavy chain of an antibody.
60. The composition of claims 1 or 2 wherein at least one of the compounds comprises the Fab portion of an antibody.
61. The composition of claims 1 or 2 wherein at least one of the compounds comprises the variable domain of an antibody.
62. The composition of claims 1 or 2 wherein at least one of the compounds comprises one or more CDR portions of an antibody.

- 5
63. A method of treating a subject afflicted with HIV-1 which comprises administering to the subject an effective dose of the compositions of claim 1 or 2.
- 10
64. A method of preventing a subject from contracting HIV-1 which comprises administering to the subject an effective dose of the compositions of claims 1 or 2.
- 15
65. An anti-CCR5 monoclonal antibody selected from the group consisting of PA8 (ATCC Accession No. HB-12605), PA9 (ATCC Accession No. HB-12606), PA10 (ATCC Accession No. 12607), PA11 (ATCC Accession No. HB-12608), PA12 (ATCC Accession No. HB-12609), and PA14 (ATCC Accession No. HB-12610).
- 20
66. A humanized form of the antibody of claim 65.
- 25
67. The antibody of claim 66, wherein some, most or all of the amino acids outside the CDR regions have been replaced with amino acids from human immunoglobulin molecules but where some, most or all amino acids within one or more CDR regions are unchanged.
- 30
68. An isolated nucleic acid molecule encoding the light chain of the monoclonal antibody of claims 65, 66, or 67.
- 35
69. The nucleic acid molecule of claim 68, wherein the nucleic acid molecule is an RNA molecule, a DNA molecule or cDNA molecule.
70. An isolated nucleic acid molecule encoding the heavy chain of the monoclonal antibody of claims 65, 66, or 67.

71. The nucleic acid molecule of claim 70, wherein the nucleic acid molecule is an RNA molecule, a DNA molecule or cDNA molecule.
- 5 72. One or more isolated nucleic acid molecules encoding the Fab portion of the monoclonal antibody of claims 65, 66, or 67.
- 10 73. The nucleic acid molecule of claim 72, wherein the nucleic acid molecule is an RNA molecule, DNA molecule or cDNA molecule.
- 15 74. An isolated nucleic acid molecule encoding one or more CDR regions of the monoclonal antibody of claims 65, 66, or 67.
- 20 75. The nucleic acid molecule of claim 74, wherein the nucleic acid molecule is an RNA molecule, DNA molecule or cDNA molecule.
- 25 76. One or more isolated nucleic acid molecules encoding the variable domain of the monoclonal antibody of claims 65, 66, or 67.
77. The nucleic acid molecule of claim 76, wherein the nucleic acid molecules are an RNA molecule, DNA molecule or cDNA molecule.

Add A11

Add B3